Ch 17 Practise Problems Chem 12 Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Total Heat Calculations

1. On a winter day at -15oC, a camper puts 750 g of snow into a pot over an open fire and heats the water to 37oC.
2. Sketch a heating curve and indicate the phase or phase change for each part of the heating section of the graph. Label each part as KE(kinetic energy) or PE (potential energy).
3. Assuming pure water and standard conditions, calculate the total energy needed to change 750 g of snow at – 15oC to water at 37oC.
4. Survival experts recommend you do not eat snow even if you are stranded without water. Eating snow greatly increases the risk of hypothermia, the lowering of the body’s core temperature. Use your previous calculations to provide a scientific basis for this advice.
5. Geothermal energy is a renewable energy resource that can supply steam to make electricity. If 100 kg of water is injected into the ground and heated from 10oC to steam(completely) at 100oC, calculate the total energy change.
6. Sometimes nuclear energy is used to produce energy by the fission of uranium. If 27 metric tonnes of water is heated from 70oC to 260oC, find the total energy required.

Calorimeter Calculations

1. If 10.0 g of urea, NH2CONH2(s), is dissolved in 150.0 mL of water in a simple calorimeter, find the molar enthalpy in kJ/mol for urea if there is a temperature change of 3.70C when the dissolving takes place.
2. An oxygen bomb calorimeter having a heat capacity of 6.49 kJ/oC is used to completely burn 1.12 g of acetylene, C2H2(g). Find the enthalpy of combustion if the temperature increases by 8.55oC.

Enthalpy From Reactions

1. Find the enthalpy of combustion for the substance that reacts with oxygen.
2. 2H2(g) + O2(g) 🡪 2H2O(g) ∆H= -483.6 kJ
3. 4NH3(g) + 7 O2(g) 🡪 4NO2(g) + 6H2O(g) + 1134.4 kJ
4. 2N2(g) + O2(g) + 163.2 kJ 🡪 2N2O(g)
5. Write an equation with the energy term written in it that shows ethanol combustion and the enthalpy of -1.28 MJ/mol. Please consider how the energy will be affected by the “balance” equation.

Hess’s Law

1. Us the given thermo chemical equations to find the enthalpy change in KJ for the following reaction.
2. 2 Al(s) + 3/2 O2(g) 🡪 Al2O3(s) ∆H= - 1675.7 kJ

2 Fe(s) + 3/2 O2(g) 🡪 Fe2O3(s) ∆H= -824.2 kJ

Fe2O3(s) + 2 Al( s) 🡪 Al2O3(s) + 2Fe(s) ∆H= ?

1. 2C(s) + O2(g) 🡪 2CO(g) ∆H= -221.0 kJ

2H2(g) + O2(g) 🡪 2H2O(g) ∆H= -483.6kJ

H2O(g) + C(s) 🡪 CO(g) + H2(g) ∆H= ?

1. 2C(s) + O2(g) 🡪 2CO(g) ∆H= -221.0 kJ

C(s) + O2(g) 🡪 CO2(g) ∆H= -393.5 kJ

2H2(g) + O2(g) 🡪 2H2O(g) ∆H= -483.6kJ

CO(g) + H2(g) + O2(g) 🡪 CO2(g) + H2O(g) ∆H= ?

1. 2H2(g) + O2(g) 🡪 2H2O(g) ∆H= -483.6kJ

2C(s) + O2(g) 🡪 2CO(g) ∆H= -221.0 kJ

CH4(g) + 2O2(g) 🡪 CO2(g) + 2H2O(g) ∆H= -802.7 kJ

C(s) + O2(g) 🡪 CO2(g) ∆H= -393.5 kJ

3H2(g) + CO(g) 🡪 CH4(g) + H2O(g) ∆H= ?

1. Finding enthalpy change ∆Ho or heat of reaction for each of the following from the standard heat of formation table.(table 17.4....or handout)
2. CH4(g) + H2O(g) 🡪 CO(g) + 3H2(g)
3. 2NO(g) + O2(g) 🡪 2NO2(g)
4. 3NO2( g) + H2O(l) 🡪 2 HNO3(l) + NO (g)
5. More practise with heat of reaction.
6. Find the energy produced for each 1.0 kg of methanol burned in a combustion reaction. Be sure to write reaction first and use table of enthalpies of formation to find enthalpy change first.
7. Find the energy produced for each 1.0 kg of hydrogen burned in a combustion reaction.
8. Calorimeter combined with heat of reaction. \*\*\*Be sure to write the reaction first\*\*\*this is how you will find enthalpy change(heat of reaction and energy per mol)
9. What is the quantity of energy available from burning 100.0 kg of anthracite coal that is burned in a thermal electric power plant that uses coal? The reaction is as follows

2C52H16O(s) + 111O2(g) 🡪 104 CO2(g) + 16H2O(g) ∆Hoc= -44.0MJ

1. Calculate the energy produced per kilogram of octane burned according to the reaction below.

2C8H18(l) + 25 O2(g) 🡪 16CO2(g) + 18 H2O(g) ∆Hoc= 10 148.2 kJ

1. How can you tell whether or not to write a reaction to find the quantity of energy from the standard heats of formation table for a calculation?

Answers

|  |  |  |  |
| --- | --- | --- | --- |
| 1.b) | 2. | 3. | 4. |
| 5. | 6a | 6b | 6c |
| 8a | 8b | 8c | 8d |
| 9a | 9b | 9c | 10a |
| 10b | 11a | 11b |  |